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SPATIAL VARIABILITY OF DRY SPELLS

A spatial and temporal rainfall analysis of the Pangani basin and Makanya catchment, Tanzania

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Rainfall and soil moisture are key parameters for food production and which are spatial and temporal variable. In a ever growing world the stress on water for food production increases. Farmers especially in semi arid regions with rain fed agriculture are more often forced to make away from "A" locations where water is available to water scares "B" or worse locations. Obliged by availability of arable land, tradition, customs, natural 6^{th} sense or farmers cleverness. To improve agricultural yields a better water resource planning ,supported by system knowledge, is needed. This study describes a Markov bases dry spell tool which can fulfil in this need.

By making use of Markov properties of rainfall, the temporal variability has been analysed. Plotting the derived seasonal transition probabilities vs. the rainfall amount a spatial variable power function could be derived.

The spatial and temporal knowledge of rainfall was combined in the Markov based dry spell tool. For a given probability the tool provides a dry spell map. The dry spell tool is a powerful tool to assess vulnerability of dry spells based on meteorological data.

The meteorological dry spell in combination with the agricultural dry spell length or critical dry spell length, which is determined by soil and vegetation characteristics, risk maps of an area to the vulnerability of dry spells could be made.

The tool was applied in a case study in the Makanya catchment and showed: Compared to the lower middle part of the catchment, high altitude parts of the catchment receive higher amounts of rainfall, have shorter meteorological dry spells and are more resilient to dry spells due to their soil and vegetation characteristics.

As a result one can state that farmers living in mountainous areas are blessed by their location. They receive more rain and have lower probability of long dry spells, higher probability of crop success and a higher probability of high yields, in contrast to the farmers in the valley. However, the latter have a chance at making a living as well. The opportunity is, next to the more traditional water management strategies (improving irrigation etc.), to develop new water management strategies (rainwater harvesting, improvement of soil characteristics and decrease of transpiration fluxes) to bridge or decrease the vulnerability of meteorological dry spells.